BAE SYSTEMS

Waveform Development Language (WDL)

Using BAE's WDL Process to Extend the Scope of the SCA closer to the Antenna

Prepared for:
JTRS JPO Technical Workshop
on DSP and FPGA Portability

Bob Prill
BAE Senior Technical Staff
29-30 April 04

WDL Component Based Design…
a Methodology for Software Defined Radios based on Petri Net Theory

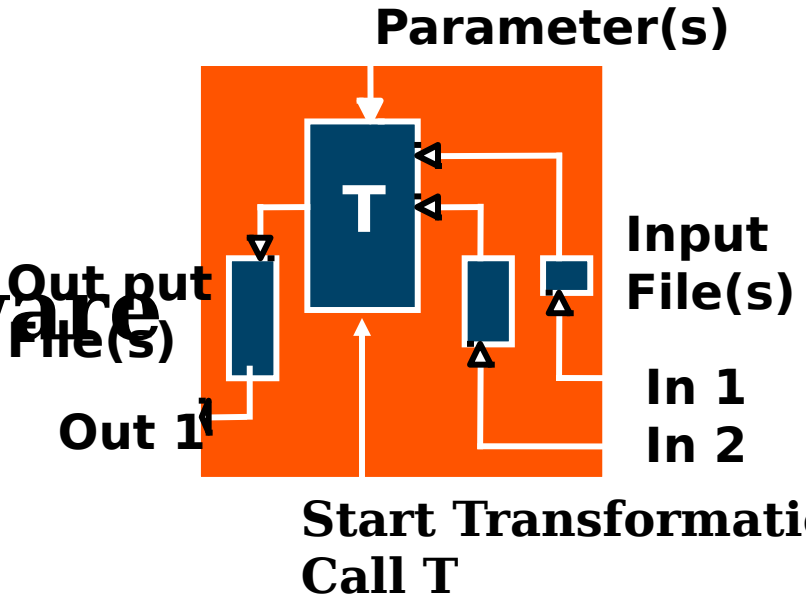
BAE SYSTEMS

Reuse

Modularity

Hardware/ Software Independence

Portability



Using the WDL Process to extend the Scope of the SCA toward the Anten

Petri nets were introduced by C.A.Petri in the early 1960s as a **ma tool for modeling distributed systems** and, in particular, notion concurrency, non-determinism, communication and synchronizatio

WDL + SCA Provides Solution to Standardization

BAE SYSTEMS

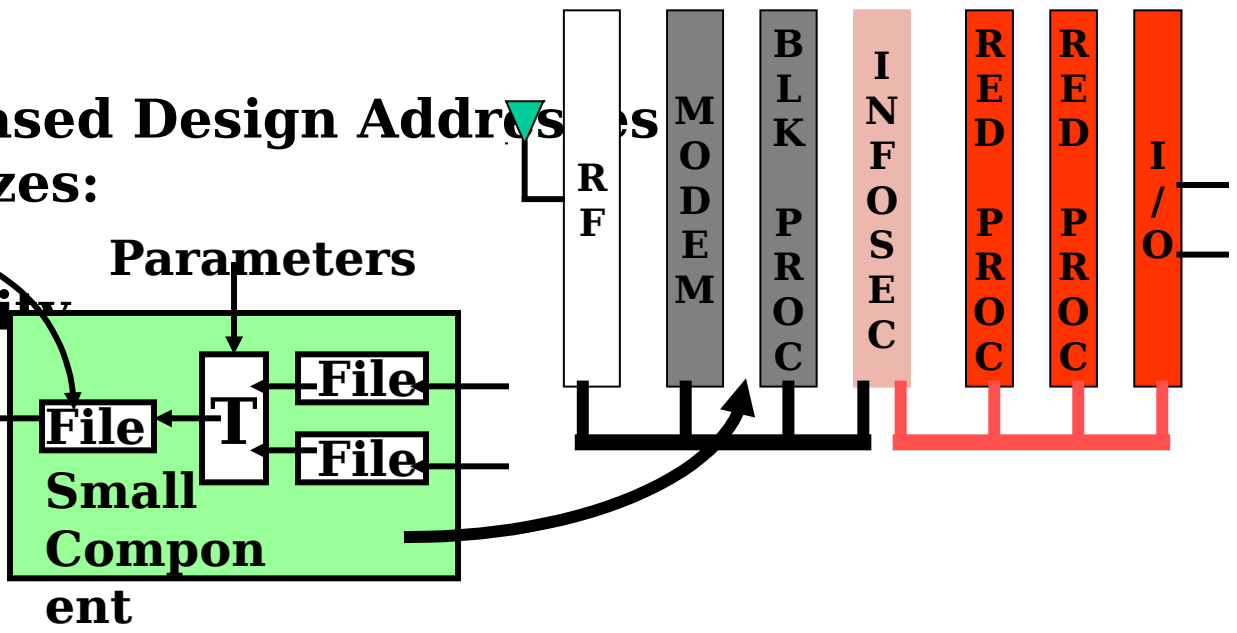
SCA Standardizes RedSide Processing
- Baseband Proc'ing,
- Data Link Layers
- Networking and higher Layers

Expect Good Portability

SCA Does not Standardize
- Internals of Modem, Blk Proc, TSEC
- Complex (Many Pieces) of Radio Code
- Complexity Increasing with AJ, LPI, TSEC

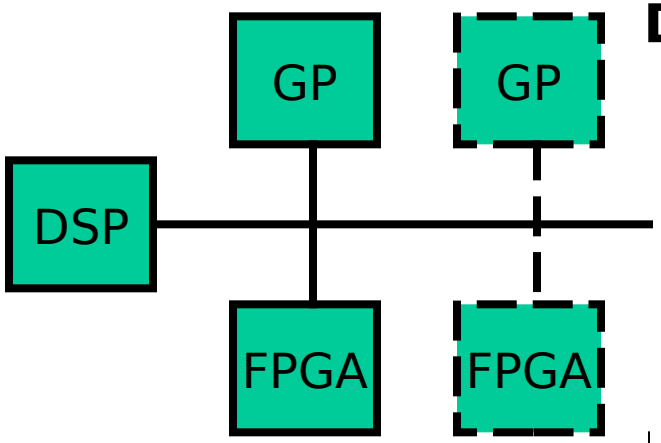
Expect Poorer Portability

WDL Component-Based Design Addresses Internals & Maximizes:
- Portability
- Interoperability
- Reuse
- Flexibility



The Portability Problem…Waveform usually Documented for Specific Architecture

BAE SYSTEMS

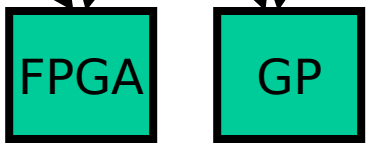


Initial **Waveform Developer** usually has preconceived notion of a Specific Hardware Implementation

	FPGA +	**DSP +**	**GP = Waveform**
VHF Radio	VHDL	C & Assy	C, ADA = VHF Waveform
SINCGARS	VHDL	C & Assy	C, ADA = SINCGARS
UHF Radio	VHDL	C & Assy	C, ADA = UHF Radio
HQ	VHDL	C & Assy	C, ADA = HQII
SATCOM	VHDL	C & Assy	C, ADA = SATCOM/DAMA
etc	VHDL	C & Assy	C, ADA = etc. Waveform

Major Porting effort**…Code documented at this detailed level is very difficult to understand and change.** Porting Effort Includes:

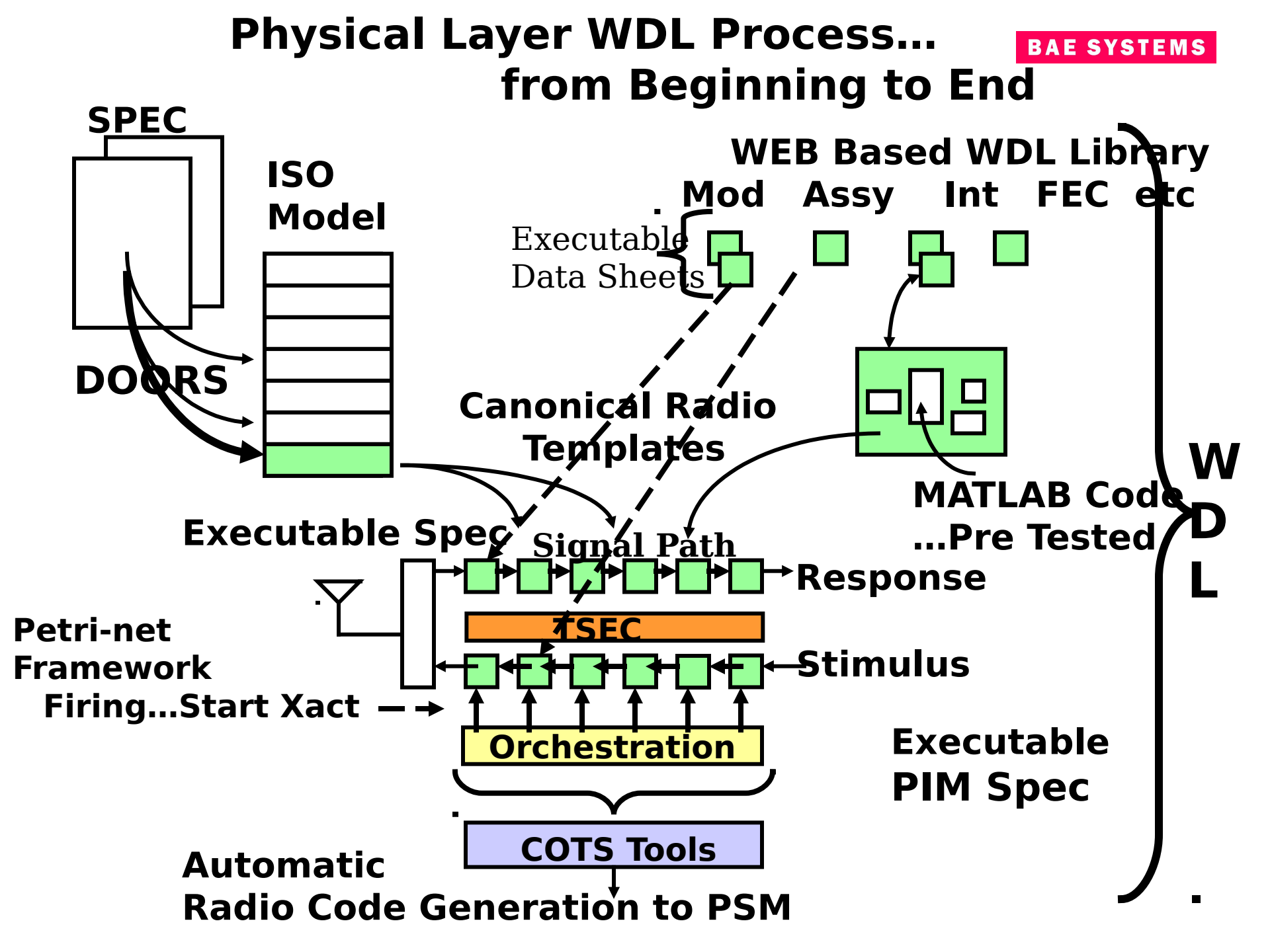
Manual Code Translation
New Timing and Control
Massive debug & retesting



+ A new HAL

Physical Layer WDL Process… from Beginning to End

BAE SYSTEMS



Summary and Suggestions

BAE SYSTEMS

- A WDL is required to achieve JTRS Waveform Portability Goals
  - Need a neutral executable behavioral specification la
    - Need way of Compiling Behavioral PIM to any Tar
    - To combinations of GPP, DSP, FPGA, other
  - Need a way of reusing PIM code…make OO Radio Co
    - Define Classes of Components…Parameterize eac
    - API's defined in XML / SCA compliant
  - Define a Canonical Radio Template… for defining Co
    - Signal Path Components…Modulators, Interleaver
    - TSEC Components
    - Orchestration Components…Timing and Control S
  - Petri Net Notation/Grammar could specify interconn
    - Petri Net theory in existence since the 60's…very l
    - CECOM has ongoing activity in Petri Net theory